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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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EXAMINER

CAO, PHAT X

| ART UNIT | PAPER NUMBER |
|----------|--------------|
|----------|--------------|

2814

DATE MAILED: 04/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/815,529

Applicant(s)

BRANDENBURG ET AL.

Examiner

Phat X. Cao

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 February 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) 10-19 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date <u>4/1/04</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of Group I, claims 1-9 in the reply filed on 2/2/05 is acknowledged. The traversal is on the ground(s) that "Even a causal read of these claims reveals that they are merely different aspects of but a single invention." This is not found persuasive because of the reasons in MPEP 806.05(f). Specifically, the process as claimed can be used to make other and materially different product. For example, the forming of product as claimed does not require the step of flowing polymeric material or the step of reducing the pressure as required by the process claims. Additionally, Applicant has not provided the reasons to support that the process as claimed cannot be used to make other and materially different product. Finally, the search is not coextensive as evidenced by the different fields of search for the process and product as cited in the restriction mailed on 1/4/05.

The requirement is still deemed proper and is therefore made FINAL.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical

Art Unit: 2814

Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000.

Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

3. Claims 1, 3-6 and 8 are rejected under 35 U.S.C. 102(e) as being anticipated by Chason et al (US. 6,800,946).

Regarding claims 1 and 5, Chason (Fig. 2) discloses a microelectronic assembly comprising: a substrate 230 of glass transparent material (column 6, lines 8-11), an integrated circuit die 210 having an active face facing the substrate 230, the active face including a central region and a perimeter region about the central region (also see Fig. 4), a plurality of bump interconnections 220 attaching the integrated circuit die 210 to the substrate 230 such that the active face is spaced apart from the substrate 230 by a gap, a polymeric encapsulant 240 (column 6, lines 53-64) about the integrated circuit die 210 on the substrate 230 and extending within the gap to encapsulant the bump interconnections 220, and an optical window 260 defined by the encapsulant 240 within the gap between the central region and the substrate 230 (also see Fig. 4 and column 6, lines 40-44).

Regarding claims 3-4, Chason (Fig. 2) further discloses that the central region of the die 210 comprises an optical feature 264 (Fig. 2) or 464 (Fig. 4) adapted for detecting or emitting optical signals through the substrate 230 (column 4, lines 7-12 and lines 15-20), and the polymeric encapsulant 240 is opaque (column 8, lines 29-31).

Regarding claims 6 and 8, Chason (Fig. 2) also discloses that the polymeric encapsulant 240 or 340 (Fig. 3) is composed of an epoxy polymer and an inorganic particulate filler (i.e., glass filler) (column 7, lines 30-35), and the bump interconnections 220 are bonded to the die 210 at the perimeter region and to the substrate 230 (also see Fig. 4).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-6 and 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Glenn et al (US. 6,571,466) in view of Chason et al (US. 6,800,946).

Regarding claims 1, 5 and 9, Glenn (Fig. 4) discloses a microelectronic assembly comprising: a substrate 102 formed of a glass transparent material (column 8, lines 44-47 and lines 55-57), an integrated circuit die 104 having an active face facing the substrate 102, the active face including a central region and a perimeter region about the central region, a plurality of bump interconnections 112 attaching the integrated circuit die 104 to the substrate 102 such that the active face is spaced apart from the substrate 102 by a gap 118, an overmolded epoxy encapsulant 116 (column 10, lines 47-48) about the integrated circuit die 104 on the substrate 102 overlying the rear face 104U of the die 104 (also see column 10, lines 31-35), and extending within the gap 118 to encapsulate the bump interconnections 112, and an optical window 120 defined by

Art Unit: 2814

the encapsulant 116 within the gap 120 between the central region 118 and the substrate 102.

Glenn does not disclose that the epoxy encapsulant 116 is a polymeric encapsulant.

However, Chason (Fig. 2) teaches the encapsulant 240 formed between the chip 210 and the glass substrate 230, and made of either epoxy or polymeric material (column 6, lines 56-64). Accordingly, it would have been obvious to form the encapsulant 116 of Glenn with either epoxy or polymeric material because such encapsulant materials are well known and commonly used for providing the bond strength and strain relief between the chip and the substrate, as taught by Chason (column 4, lines 35-39).

Regarding claims 2-3, Glenn (Fig. 4) further discloses that the integrated circuit device 104 comprises a rear face 104U opposite the active face 104L, the epoxy encapsulant 106 is a molded body overlying the rear face (also see column 10, lines 31-35), and the central region of the die 104 comprises an optical feature 106 adapted for detecting/emitting optical signals through the substrate 102 (column 8, lines 44-47).

Regarding claim 8, Glenn (Fig. 4) further discloses that the bump interconnections 112 are bonded to the die 104 at the perimeter region and to the substrate 102.

Regarding claims 4 and 6, Chason (Fig. 2) also teaches that the polymeric encapsulant 240 is opaque (column 8, lines 29-31), and composed of an epoxy polymer

Art Unit: 2814

filled with an inorganic filler (glass) (column 7, lines 33-40) for improving thermal expansion characteristics of the polymeric encapsulant (column 6, lines 56-58).

6. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chason et al (US. 6,800,946) in view of Gonzalez et al (US. 2003/0080437).

As discussed in details above, Chason (Fig. 2) discloses that the substrate 230 is formed of glass (column 6, lines 8-11) and the encapsulant 240 is a polymeric material filled with inorganic filler (column 7, lines 33-40). Chason does not disclose that the polymeric encapsulant 240 has a thermal expansion coefficient (CTE) in a range as claimed.

However, Gonzalez (Fig. 6) teaches the forming of inorganic filler encapsulant 116 (par. [0038]) between the chip 130 and the FR-4 glass substrate 110 (par. [0040]). The inorganic filler encapsulant 116 has lower CTE and has relatively closer CTE match to the chip 130 and the substrate 110 by adding a suitable amount of inorganic filler in a range of 0% to 80% by weight (par. [0039] and par. [0040]). Accordingly, it would have been obvious to adjust the thermal expansion coefficient (CTE) of the filler encapsulant 116 in a range as claimed for providing the closer CTE match between the chip and the substrate because the CTE of the filler encapsulant can be controlled depending upon the CTE of the glass substrate and depending upon the amount of filler (0% to 80%) added to the encapsulant, as taught by Gonzalez (par. [0040]).

7. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Glenn et al and Chason et al as applied to claim 1 above, and further in view of Gonzalez et al (US. 2003/0080437).

As discussed in details above, the combination of Glenn and Chason substantially reads on the above claim. Chason (Fig. 2) further discloses that the substrate 230 is formed of glass (column 6, lines 8-11) and the encapsulant 240 is a polymeric filled with inorganic filler (column 7, lines 33-40).

Chason does not disclose that the polymeric encapsulant 240 has a thermal expansion coefficient (CTE) in a range as claimed.

However, Gonzalez (Fig. 6) teaches the forming of inorganic filler encapsulant 116 (par. [0038]) between the chip 130 and the FR-4 glass substrate 110 (par. [0040]). The inorganic filler encapsulant 116 has lower CTE and has relatively closer CTE match to the chip 130 and the substrate 110 by adding a suitable amount of inorganic filler in a range of 0% to 80% by weight (par. [0039] and par. [0040]). Accordingly, it would have been obvious to adjust the thermal expansion coefficient (CTE) of the filler encapsulant 116 in a range as claimed for providing the closer CTE match between the chip and the substrate because the CTE of the filler encapsulant can be controlled depending upon the CTE of the glass substrate and depending upon the amount of filler (0% to 80%) added to the encapsulant, as taught by Gonzalez (par. [0040]).

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phat X. Cao whose telephone number is (571) 272-1703. The examiner can normally be reached on Monday - Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2814

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PC
April 15, 2005


PHAT X. CAO
PRIMARY EXAMINER